

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Shigeki Satou et al.
Application No. : 10/573,959
Filed : March 29, 2006
For : METHOD FOR PREPARING CONDUCTIVE PASTE FOR INNER
ELECTRODE OF MULTI-LAYERED CERAMIC ELECTRONIC
COMPONENT

Examiner : Khanh Tuan Nguyen
Art Unit : 1796
Docket No. : 890050.538USPC
Date : March 5, 2008

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE

In the Office Action dated November 20, 2007, the claims 5 and 6 are rejected under 35 U.S.C § 112, second paragraph, as being indefinite. Furthermore, claims 1, 3, 4, 7, and 12-14 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,372,185, to Hashimoto et al. (hereinafter, “Hashimoto”). Claims 2, 8, 9, 11, 15, and 16 are rejected under 35 U.S.C. § 103(a) as being obvious over Hashimoto in view of U.S. Patent No. 7,001,539, to Oda et al. (hereinafter, “Oda”). Claims 5 and 6 are rejected under 35 U.S.C. § 103(a) as being obvious over Hashimoto in view of U.S. Patent No. 6,265,090, to Nishide et al. (hereinafter, “Nishide”). Applicants respectfully request reconsideration of the present application in view of the following remarks.

Rejections Under 35 U.S.C. § 112

In the Office Action, it is asserted that in claim 5, it is unclear how the upper limit of 94% of solid concentration can be obtained by kneading when a maximum of 1.5% weight of

binder and 85.7% weight of conductive powder are kneaded in a 12.8% weight of solvent. The Examiner calculates the maximum solid concentration to be about 87%. However, the respective weights of the binder, solvent, and conductive powder can vary between the claimed ranges, and any combination thereof is claimed in claim 5. It appears that the Examiner's calculation takes is based on the maximum value of all of the respective weights, namely, 1.7 weight parts of the binder, 15.0 weight parts of the solvent, and 100 weight parts of the conductive powder. Applicants respectfully submit that the upper limit of 94% solid concentration can be obtained when the amounts of the binder and solvent contained in the mixture are used toward their minimum values.

Claim 6 is also rejected based on the assertion that taking all weight proportions at their maximum value, results in about 91% solids concentration. Similarly here, the Examiner takes the maximum values for the binder and solvent in calculating the solids concentrations; however, claim 6 claims a range for the weight proportion of the binder and solvent, and when less than the maximum value is used, an upper range value of 92% solids concentration is attainable.

Accordingly, claims 5 and 6 of the present application are definite and in compliance with 35 U.S.C. § 112. Applicants respectfully request that the indefiniteness rejections of claims 5 and 6 be withdrawn in light of the foregoing discussion.

Rejections Under 35 U.S.C. § 102

Claims 1, 3, 4, 7, and 12-14 are rejected as being anticipated by the specification in Hashimoto. Independent claim 1 recites, "a kneading step of kneading a conductive powder, a binder and a solvent to form a clay-like mixture and a slurring step of adding the same solvent as that used at the kneading step to the mixture obtained by the kneading step to lower the viscosity of the mixture, thereby slurring the mixture." (Emphasis added). In contrast, Hashimoto is silent with respect to the feature of forming a clay-like mixture. Furthermore, in claim 1, the same solvent that is used at the kneading step is added to the mixture obtained by the kneading step to lower the viscosity of the mixture. In contrast, and as correctly recognized by the Examiner, in Hashimoto, "[o]rganic solvents are added to the filtered paste to adjust its

viscosity.” Hashimoto, column 4, lines 40-41. Hashimoto fails to teach forming a clay-like mixture and that the same solvent used at the kneading step is added to the mixture.

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” MPEP 2131. In the Office Action, it is summarily concluded that Hashimoto “specifically or inherently meets each of the claimed limitations.” Office Action, p. 5. Applicants respectfully disagree. There is no express or inherent description of a clay-like mixture or addition of the same solvent used at the kneading step to the mixture obtained by the kneading step. “The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.” MPEP 2112.IV (emphasis original). “To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.” *Id.* The Office Action does not establish any extrinsic evidence that makes clear formation of a clay-like mixture and addition of the same solvent to the mixture that is used at the kneading step.

Furthermore, the description in Hashimoto lends to the interpretation that in that patent, a different solvent is added for adjusting the mixture viscosity. Hashimoto states that “Organic solvents are added to the filtered paste.” Hashimoto, column 4, lines 40-41. This portion of the specification provides antecedent basis for the organic solvents that are added to adjust viscosity, thereby signaling that the added organic solvents are different from those used during the kneading step. If they were the same, the portion of the Hashimoto specification discussing addition of organic solvents would have read, the organic solvents, to indicate that antecedent basis has already been provided for these solvents in the kneading step.

Based on the foregoing, Hashimoto does not disclose or even suggest the features of present claim 1, that a conductive powder, a binder and a solvent are kneaded to form a clay-like mixture and that the same solvent as that used at the kneading step is added to the mixture obtained by the kneading step to lower the viscosity of the mixture, thereby slurring the mixture. Accordingly, Hashimoto fails to anticipate claim 1, and independent claim 1, and

dependent claims 2-9 and 11-16, which are dependent from claim 1, are allowable over Hashimoto.

With respect to dependent claim 3, the Office Action considers certain proportions of Ag powder, Pd resinate, inorganic binder, and organic binder, and organic solvent, to calculate a yielded total of 83% weight of “conductive particle (Ag-Pd).” Office Action, p. 5. Claim 3, recites, *inter alia*, “the conductive powder, the binder and the solvent are kneaded until the solids concentration of the mixture reaches 84% to 94%. In order to anticipate the claims, the claimed subject matter must be disclosed in the reference with sufficient specificity to constitute an anticipation under the statute. MPEP 2131.03.II. As the examples in MPEP 2131.03.II demonstrate, even when a cited range overlaps a claimed range, they may not necessarily present sufficient specificity to anticipate the claimed range. In the present instance, Hashimoto is silent to a solids concentration, let alone disclosing the claimed range with sufficient specificity. In the Office Action, a solids concentration of 83% is calculated and asserted to be derived from other parameters disclosed in Hashimoto. Even if Hashimoto was considered to disclose this solids concentration, which it does not, this is just one specific percentage, which falls outside of the range claimed in claim 3. Accordingly, even the calculated percentage does not disclose the claimed range with sufficient specificity. Therefore, claim 3 is allowable for being dependent from claim 1 and also on its own merits.

Claim 12 is rejected over Hashimoto based on the assertion that Hashimoto teaches the conductive material are mixed and kneaded by automatic mortar or a three roll mill. However, claim 12 recites, “the slurry obtained by the slurring step is continuously dispersed using a colloid mill.” Hashimoto does not disclose continuous dispersion and use of a colloid mill, which belongs to a closed type emulsifier. The devices used in Hashimoto, namely, the mortar and three roll mill, belong to an open type emulsifier. As discussed in the present application in the specification, at page 6, lines 14-19, using a closed type emulsifier makes it possible to suppress change in the solids concentration of the slurry at the dispersing step and markedly improve the efficiency of manufacture of the conductive paste in comparison with the case where the slurry is dispersed using a three-roll mill to prepare a conductive paste. Since

Hashimoto fails to disclose continuous dispersion and a closed type emulsifier, it does not anticipate claim 12. Therefore, claim 12 is also allowable on its own merits.

Rejections Under 35 U.S.C. § 103

Claims 2, 8, 9, 11, 15, and 16 are rejected as being obvious over Hashimoto in view of Oda. These claims are dependent directly or through an intervening claim from claim 1. Accordingly, these claims are allowable at least because they include all the features of claim 1, which as demonstrated above, is allowable over Hashimoto. Furthermore, claim 2 recites, “the conductive powder, the binder and the solvent are kneaded until the mixture reaches the wetting point (ball point) thereof.” The “wetting point” recited in claim 2 indicates a time at which the entire surface of conductive powder becomes wet. Since the kneading continues until the mixture reaches the wetting point, claim 2 defines a time at which the kneading operation is terminated.

In contrast, Oda merely discloses that “it is desirable to add a surface active agent together with the solvent to enhance the wetting effect of the solvent on the metal particles” Oda, column 3, lines 27-29. It is in this context, that Oda asserts, “the solvent is added to wet the metal particles.” Oda, column 3, lines 60-61 (the portion of Oda references in the Office Action). This description refers only to the inherent function of the surface active agent. This is not the same as disclosing that the conductive powder, the binder, and the solvent are kneaded until the mixture reaches the wetting point. That is, the disclosed enhanced wetting in Oda is not the same as kneading until the mixture reaches the wetting point. Further, as discussed in more detail below, the wetting effect of Oda does not correspond to the wetting point (ball point) in claim 2. Accordingly, claim 2 is also allowable on its own merits.

In addition, claim 8 recites, “a step of adding a dispersing agent to the mixture obtained by the kneading step, thereby slurring the mixture.” In contrast, and as recognized by the Examiner, in Oda, a surface active agent is added to a slurry containing metal particles together with solvent when the composite substrate is prepared. *See* Oda, column 3, lines 27-32; column 4, lines 38-56. Since the surface active agent is added to the slurry together with solvent in Oda, that patent fails to disclose the features of claim 8, in which the mixture containing the

dispersing agent is not kneaded; rather, the dispersing agent is added after the kneading step. Accordingly, claim 8 is also allowable on its own merits. This also evidences that the wetting effect of Oda does not correspond to the wetting point (ball point) in claim 2.

Claim 16 recites, “a polyethyleneglycol system dispersing agent whose hydrophile-liophile balance (HLB) is 5 to 7 is employed as the dispersing agent.” The Office Action states that Oda’s surface active agent disclosure is considered to read on these features. Office Action, p. 6. However, Oda does not teach, suggest, or motivate in any way a polyethyleneglycol system dispersing agent or the HLB of a dispersing agent. Accordingly, the inference drawing in the Office Action, namely, that the specification in Oda reads on these features is attenuated. Additionally, claim 16 recites a specific range for the HLB, and as discussed above, sufficient specificity is required to anticipate a range per the MPEP. Although Oda is not used as an anticipatory reference, the Office Action solely refers to Oda for supporting the proposition that the mere recitation of “surface active agent” in Oda reads on a polyethyleneglycol system dispersing agent whose HLB is 5 to 7. However, such a recitation cannot satisfy the “sufficient specificity” requirement. Therefore, claim 16 is also allowable on its own merits.

Claims 5 and 6 are rejected as being obvious over Hashimoto in view of Nishida. Claims 5 and 6 are dependent from claim 3, which in turn is dependent from claim 1. Accordingly, claims 5 and 6 are allowable at least because claims 1 and 3 are allowable as demonstrated above. In addition as discussed below, claims 5 and 6 are allowable on their own merits.

Claim 5 recites, “steps of adding 0.25 to 1.7 weight parts of the binder and 3.0 to 15.0 weight parts of the solvent to 100 weight parts of the conductive powder and kneading the conductive powder, the binder and the solvent until the solids concentration of the mixture reaches 84 to 94%.” Claim 6 recites, “steps of adding 0.5 to 1.0 weight parts of the binder and 2.0 to 10.0 weight parts of the solvent to 100 weight parts of the conductive powder and kneading the conductive powder, the binder and the solvent until the solids concentration of the mixture reaches 85 to 92%.”

The Office Action suggests that the solids concentration ranges of claims 5 and 6 can be calculated from Hashimoto and that Nishide disclose the proportion of the conductive powder. Applicants respectfully disagree. Hashimoto states that the paste further contains 2 to 6% weight of inorganic binder. Hashimoto, column 1, lines 33-38, and column 4, lines 20-34. If it is assumed that Ag corresponds to conductive powder, the paste in Hashimoto contains 3.75 (3X100/80) to 18.3 (11X100/60) weight parts of binders and 12.5 (10X100/80) to 33.3 (20X100/60) weight parts of solvent with respect to 100 weight parts of conductive powder. On the other hand, if it is assumed that Ag and Pd correspond to the conductive powder, then the paste contains 3.61 (3X100/83) to 18.0 (11X100/61) weight parts of binders and 12.0 (10X100/83) to 32.8 (20X100/61) weight parts of solvent with respect to 100 weight parts of conductive powder. In either scenario, the combination of ranges disclosed in claims 5 and 6, are not disclosed by either Hashimoto or Nishide, and neither reference teaches a paste containing a solid concentration of 84 to 94% with respect to claim 5, and 85 to 92% with respect to claim 6. Therefore, claims 5 and 6 are also allowable based on their own respective merits.

As demonstrated above, all of the claims remaining in the application are now allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,
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